$$\mathbb{P}(A \cap B) = \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(A \cup B)$$

$$\mathbb{P}(A \mid B) = \frac{\mathbb{P}(A, B)}{\mathbb{P}(B)}$$

! $$\text{MTTF} = \mathbb{E}[T] = \int_0^{+\infty} t f(t)\,dt = \int_0^{+\infty} (1 - F(t))\,dt = \boxed{\int_0^{+\infty} R(t)\,dt}$$

most convenient

$$\sum_{k=0}^{+\infty} \frac{a^k}{k!} = e^k$$

$$\text{unreliability} = \mathbb{P}(X_T = 1)$$

$X \sim N(\mu_x, \bullet)$

coefficient of variation $= \delta$

$\Longrightarrow \quad \sigma_x = \delta \mu_x$

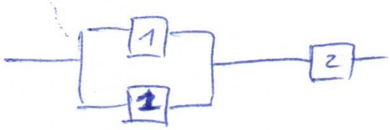
$$\mathbb{P}(X_2 > X_1) = \int_0^{+\infty} \mathbb{P}(X_2 > t \mid X_1 = t)\, f_{X_1}(t)\,dt$$

$n \perp\!\!\!\perp$ comp. failure time $\sim \mathcal{E}(\lambda_j)$

$$\mathbb{P}(\text{component } j \text{ is the } 1^{st} \text{ to fail}) = \frac{\lambda_j}{\sum_{i=1}^{n} \lambda_i}$$

Poisson $\rightarrow$ models always with t

$R = R_1 R_2$



$R = (1 - (1 - R_1)^2)\, R_2$

$R = (1 - (1 - R_1)^2)\,(1 - (1 - R_2)^2)$

$(1 - e^{-\lambda t} \approx \lambda t)$, $(T + \tau \approx T)$

- ~~Distributions~~:
  - ~~densities~~
  - ~~meaning~~ ~~(? Poisson ? Exponential)~~

~~$f(t)$ pdf of the failure~~

$$\cancel{MTTF = \int_0^\infty t\, f(t)\, dt = \int_0^\infty R(t)\, dt}$$

$$\cancel{= \int_0^\infty \left(1 - F(t)\right) dt = \mathbb{E}[T]}$$ ~~T failure time~~

~~Tabelle Φ, χ^2 ...~~

$$\cancel{\sum_{k=0}^{+\infty} \frac{a^k}{k!} = e^k}$$

~~Unreliability $= \mathbb{P}(X_{TOP\ event} = 1)$~~

Event tree chapter

$R(t) = \dots = \dfrac{\dots}{k-2}$ (k given) $\rightarrow$ if $k \neq 2$,
otherwise:
(repeat with $k=2$)

$$\mathbb{P}(X_T = 1) \cong \sum_j \mathbb{P}(M_j)$$
$$\mathbb{P}(X_T = 1) = 1 - \prod_j \left(1 - \mathbb{P}(M_j)\right)$$

MARKOV: (1)

- $T_1 \sim \mathcal{E}(\lambda_1), T_2 \sim \mathcal{E}(\lambda_2) \rightarrow$ 1 repairman $\rightarrow$ 2 different states for "both broken, one repairing"
- $\underline{\pi} \cdot \underline{\underline{A}} = \underline{0}$
- mean number of total failures in 1000 days:
  $f = \pi_{okay}\ \lambda_{okay \to failed}$ = departure frequency
  mean number of failures: $f \cdot 1000$
- # condition in 100 days?
  $f = \sum \left(\pi_{\text{states that go in that condition}}\right)\left(\lambda_{going}\right) \rightarrow f \cdot 100$